AGRICULTURAL EXPERIMENT STATION

4

ANNUAL REPORT

OF THE

President of the Board of Regents

OF THE

STATE AGRICULTURAL COLLEGE

TO THE

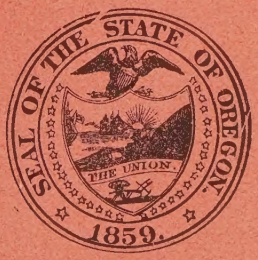
GOVERNOR OF OREGON

FOR THE YEAR ENDING JUNE 30, 1892.

Legislative Assembly, Seventeenth Regular Session,

1893.

PUBLISHED BY AUTHORITY.



SALEM, OREGON:
FRANK C. BAKER, STATE PRINTER.
1893.

4

ANNUAL REPORT

OF THE

President of the Board of Regents

OF THE

STATE AGRICULTURAL COLLEGE

TO THE

GOVERNOR OF OREGON

FOR THE YEAR ENDING JUNE 30, 1892.

Legislative Assembly, Seventeenth Regular Session,

1893.

PUBLISHED BY AUTHORITY.

SALEM, OREGON:
FRANK C. BAKER, STATE PRINTER.
1893.

REPORT.

To His Excellency, Sylvester Pennoyer, Governor of Oregon :—

SIR: I have the honor to forward to you the following report from the President of the Board of Regents of the State Agricultural College of Oregon.

Very respectfully,

WALLIS NASH,
Secretary.

Corvallis, January 4, 1893.

THE STATE AGRICULTURAL COLLEGE.

To His Excellency, Sylvester Pennoyer, Governor of Oregon:—

SIR: It becomes once more my duty, as President of the Board of Regents of the State Agricultural College, to present a report of the condition and working of this institution to you as representing the State of Oregon. Two years ago I had a similar duty to perform. In the report then presented, hopes were expressed that time would demonstrate the soundness of the plans of government and control adopted by this Board. The proof was to consist in an increasing number of students, supplied from those special classes of our citizens chiefly interested in agriculture and the mechanic arts, in the visible improvement of the students of both sexes in their studies, deportment, and character, and in the increased influence of the College and Experiment Station on the people of the State.

The report of President Bloss, appended to this report, gives, in the opinion of this Board, satisfactory evidence of the widely extending influence for good now being exerted throughout Oregon by the State Agricultural College. The institution has lost whatever was local and restricted in its roll of students, who are now sent to us from all parts of the State. The bulletins sent out from the Experiment Station at frequent intervals have now a circulation of nearly five thousand copies. The farmers' institutes under the direction of the College are welcomed everywhere. The attendance at these pleasant meetings constantly increases, and lively interest is always shown in the papers and debates on the many and diverse topics affecting the farming community.

It is freely admitted that for any institution for the training of our children the students themselves, as they pass out into life, are by far the best and most permanent advertisement of their alma mater. Our College is still too young for this kind of influence to be widely felt. Only in the coming year will the first class of graduates pass from the walls of the College into the wide world who have been trained in the State Agricultural College since it came under the direct control and government of the regents directly chosen by the State. It is a great satisfaction to the Board to believe that the character and good name of the College will be safe in the

hands of these young people. I desire to lose no opportunity of impressing on them their responsibility in this regard.

The year 1891 was one of steady growth and development under the Presidency of the late Prof. B. L. Arnold. To the high character and thorough scholarship of this gentleman the College owes much. His rule was just, kind, courteous; his habits those of constant industry and conscientiousness. The extent and depth of his influence over his students were only demonstrated by his unexpected death in January, 1892.

The Board of Regents felt to the full their responsibility in the choice of a successor. They recognized that as is the President, so will be the college which he governs. Not only are high personal character and wide and deep knowledge essential, but the President must be a ruler of men—full of tact, and experienced in the difficult art of government. In the case of the Agricultural College, moreover, special technical knowledge is demanded. The direction of the Experiment Station calls for a man in sympathy with the special needs of the farmers in the transition state marked by the development of the orchard, fruit farm, and general farm, yielding many products from the wide wheat farms and stock ranches of the past decade. The Board took steps to make the impending selection very widely known. Their success was proved by the receipt of nearly forty applications from all parts of the Union. A careful scrutiny reduced the number of selected candidates to five. Still closer examination of the qualifications of the selected candidates was followed by the choice of Professor John M. Bloss, then of the Topeka schools, an educator of long and varied experience, who had filled most important positions for many years both in Indiana and in Kansas, and who brought with him to Oregon both the cordial good wishes and the genuine regrets of all his former associates. The new President took charge of the College and Station in May last, very near the close of the college year.

The Board felt it to be very desirable that the new President should have all the time possible before the opening of the next college year to know and be known in all parts of the State, and to use such methods as he might approve for attracting students to the College. It is right at this point to notice the fact that the Board placed on Professor J. D. Letcher, as the senior professor, the temporary charge of the College in the sudden necessity consequent on Professor Arnold's death. The responsibility was at once assumed by Professor Letcher, although at that time he was suffering from depressing sickness, in which a less conscientious man might have readily found an excuse. The facts of growth and development which will be found to be detailed in President Bloss' report,

appear to the Board to justify to the full the selection they made. I desire to emphasize our conviction that not in numbers alone, but rather in the raised tone, character, and attainments of the students, is to be found the proof that the President is the right man in the right place.

The report of the Experimenting Station will show what is being done in that most important direction. The increasing favor and influence of the farmers' institutes under the present management are, I believe, patent to all. It is most gratifying to the State Board of Regents to be able now to record the fact that the Supreme Court of Oregon, in a careful, deliberate, and thoroughly reasoned decision, confirmed the State of Oregon in the possession and unshared and undisputed control of this College and its property and possessions. Although the Board never failed in their conviction that this result would follow surely on the full exposition of the position of the State, it is without doubt a still farther argument in support of the desires of the Board that the Legislature should continue their fostering care and development of this their own College. While it is a matter of great regret to the Board to have to appeal once again for further funds for building and furnishing purposes, yet the argument now comes with added force that it is the undoubted growth and development of the institution which demands it. To appeals for a stationary or retrograding school, a Legislature might turn a deaf ear. For this College, only now entering on a full career of usefulness to the State, and fed and maintained with yearly increasing funds by the munificence of the General Government, it seems to me that it would be hard to refuse any moderate and well considered amount needed for new buildings in which to utilize, for the benefit of the State, the Government appropriations. The full details of the sum which this Board desires to expend for the benefit and extension of the College, are found in the report of President Bloss on the last page thereof. To these details I desire to call special and favorable attention.

One thing is sure: It is impossible for any institution to remain stationary. To endeavor to stand still is to retrograde. That is the exact condition of the State Agricultural College to-day. Its rooms are full to overflowing. The work-shops of the mechanical department cannot give room, nor does the present equipment in tools suffice for even the students we now have. There is not room in its chemical, zoölogical, and botanical laboratories for the student-work there on which their improvement depends, under the intelligent and modern method applied to them to-day. The horticultural department is without even any lecture or teaching-room at all, and badly needs other facilities. The agricultural department now over-

flows the barn and shed-room it has, and is unable, without further funds, to tile-drain and otherwise develop the farm, which is to be the best of object lessons to the farmers of Oregon as well as to the students. The department of photography is put away in a slip of a room, without the possibility of a skylight by means of which to print. The number of students has overgrown the desk and table-room which was thought adequate two years ago. The chief increase in numbers is in the College classes proper, not in the preparatory department, which comes into comparison with the public schools. Even if the preparatory department were cut off altogether, the application for building and furnishing funds would still have to be presented. But, this same preparatory department serves to open the doors of the College to some of the most eager and struggling students.

The reports of the special committees on accounts are presented with this report, as well as the summaries of accounts and expenses of both College and Station. Even at the risk of repetition, it must again be stated that the receipts both from the land grant and from the General Government are annual receipts, to be used only in payment of professors' salaries and other current annual outgoings. Not one cent of that money can be used for buildings or other permanent improvements, however urgent the necessity. The Government asks of the State that she should provide the buildings and other permanent means and appliances wherewith to utilize, for the benefit of the State, the teaching and experimenting force provided by the Government. The only exception is that five per cent of the Station Fund received annually from the Government may be used on buildings, etc., for station purposes. With this account of the wide and most useful future now open before this College and Station, the Board must leave the matter to the wisdom and liberality of the Legislature of Oregon.

Respectfully submitted,

W. S. LADD,
President of the Board of Regents.

Corvallis, January 4, 1893.

CORVALLIS, OREGON, December 31, 1892.

Hon. William S. Ladd, President of the Board of Regents, State Agricultural College:—

MY DEAR SIR: I herewith transmit to you, and through you to the Board of Regents, the following report on the purposes and needs of the State Agricultural College, together with statistics showing its enrollment for the past two years. The report also con-

tains a summary of the work of this station for the time mentioned, and is placed over the signatures of the several professors and instructors.

PURPOSES OF THE SCHOOL.

The State Agricultural College of Oregon has been organized under the National law for the establishment of such schools. It includes within its curriculm all those brances of study and lines of discipline contemplated in that Act. The following is a brief outline of its purposes and a statement of what has been done to carry out these purposes.

Neither the State nor the Nation can afford to establish and to sustain a system of education which does not have for its basal thought the making of better citizens of those who come directly under its influences. Better citizenship does not depend wholly, nor even primarily, upon intellectual culture, because loyalty to both the State and the Nation, loyalty to duty, honesty of purpose, unflinching fidelity, personal purity, and willingness to submit to legal restraints, are each elements essential to the perpetuity of the State and the Nation. Hence an effort has been made in this institution to cultivate, by direct instruction in ethics, all the nobler traits of mind and heart, as well as to surround the student as far as possible by all those influences which lead to higher ideals of duty and respect of self.

It has been the purpose of the Faculty and the President of this institution to combine ethical teaching with the instruction in all the branches taught. Hence it is believed that every reasonable effort is being made to prepare the youth of this institution for better citizenship, thus justifying the State and Nation in their beneficence.

The intellectual culture contemplated in this College does not vary in quality from that obtained in other educational institutions in the State, nor should it.

Education involves information, yet it is not information. Education awakens the faculties of the mind to energetic action, but this is not education; it is only a means. Education involves the training of the faculties of the mind, and the rendering of these intellectual faculties submissive to the control of the will. It is the result of all these processes of training that terminates in education. Such training may be secured while pursuing the work laid out in the curriculm of the Agricultural College, as well as in the private college, the normal school, or the university.

By the law of its organization the Agricultural College has a special field of work assigned to it—a field which is covered only in the minor details by the work of any other State or private institu-

tion. When organized to fulfill its highest mission, it is a polytechnic school, where the scientific principles underlying the great business industries—agriculture, mechanic arts, and household economy—are taught in conjunction with military discipline and military science. Agriculture is here used in its broadest sense, and embraces all appertaining to the art of good husbandry, including horticulture, veterinary science, and all that relates to the proper rearing of animals and plants and their preservation from disease. Mechanical industries include all the forms of work in wood and metals, as well as the manufacture of machinery for the application or transmission of power. This is a broad field, and a proper investigation of these subjects as sciences and as arts, makes it necessary to study thoroughly several other branches of learning. The study of English must be pursued; first, that the constructive imagination of the student may be cultivated; second, that he may be able to comprehend the literature of the subjects studied; and, third, that he may be enabled to express accurately and intelligently the results of his researches, and thus become a valued member of society. For these reasons the study of English and training in the art of expressing thought has been made obligatory upon all students. An understanding of the science of agriculture includes a knowledge of the proper preparation of soils for the reception of a crop. Hence the student must understand how to secure the best mechanical condition of the soil, not only how to cause the immediate disintegration of the tough and baked clayey soils by direct physical means, but he should understand how tile-drainage renders such soils permanently friable. The latter involves a knowledge of engineering and a study of the philosophy of tile-drainage and irrigation as well. To insure the best returns from the farm, the chemical properties of the soil must be known, as well as the chemical constituents of its products. To improve the impoverished soil, a knowledge of the needed fertilizer must be known. To feed stock successfully, the chemistry of food plants must be ascertained, and properly adapted to their needs. Thus if ten bushels of wheat contain only enough lime to make the shells of five dozen eggs, it alone would be an unprofitable food for poultry. If one hundred pounds of clover hay has more lime in it than one hundred bushels of wheat, it might be used as a valuable food where lime is needed. Hence agriculture necessarily involves a thorough knowledge of inorganic and organic chemistry. For this reason, the course in chemistry has been extended, and the pupils are required to do a large amount of work in the chemical laboratory. In this respect our plant, although limited in room, is made to accomodate about thirty students. Agriculture also involves a

knowledge of the breeds of stock, as well as the means of securing the most rapid growth and the prevention of disease. Hence a knowledge of comparative anatomy and veterinary science is essential. But food plants are liable to be injured or destroyed by disease, or they may become the prey of insects. Hence the agriculturist and the horticulturist must have a knowledge of entomology and insecticides. Here again opens up a wide field for the investigation of the true scientist and agriculturist. The microscope and a knowledge of microscopy now become essential. This field is one which is ever widening with the growth of science, and is as yet comparatively untouched. Observers are needed upon every farm in order to overcome the ravages committed upon the growing crops. Every student of agriculture and household economy is required to study entomology in the laboratory, in order that a thorough acquaintance with the known pests to agriculture and horticulture may be acquired.

Our laboratories in chemistry, physics, and along biological lines are small, not giving sufficient room for the students now engaged; they are, while the best in the Northwest, incomplete as compared with that of the best institutions. The rapid growth of the school shows that more room and a larger and more complete equipment is needed to meet the demands of our work. Laboratory work is essential to the successful study of all subjects, and it is the only method which can inspire the student to become a real investigator. Upon the number of educated investigators is dependent the rapid development and the material prosperity of the State. Horticulture, when studied from a scientific point of view, is not only ennobling to the mind, but is a subject of greatest profit to the State. With this subject, as with certain fields in agriculture, the science of botany is intimately related, and becomes in its proper study an important factor. The study of plant life, methods of growth, the means and the manner of decay, the plan of cell formation, the philosophy of circulation, the methods of repair, the processes of fertilization, are all inspiring subjects to the earnest student, and open up to him broad fields rich in thought. The philosophy of budding, grafting, transplanting, and methods of propogation have a high educative as well as esthetic value. The laboratory process is carried on in the study of this subject; hence all the pupils who study agriculture and household economy are required to learn the art of budding, grafting, methods of pruning, and caring for flowers, for testing the values of vegetable products and modes of culture. Here, as will be found in other departments, we have reached the limits of our quarters. There is not room for the proper instruction and work in our ever-growing classes.

The mechanical department covers a wide range of work and investigation. Here is laid the foundation upon which the work of the artist and the artisan and of those who conduct the great business industries must rest. This training consists of a college course of four years, and includes a thorough and more extended knowledge in physics and in mathematics than the other courses. Here is brought into use the students' knowledge of freehand drawing. Here their knowledge of physics and calculus is applied in studying the machine and the laws producing motor powers. Here mechanical drawing is taught and applied in preparing the drawings from which work in wood and metal is fashioned. In this course, not only the study of the philosophy underlying mechanics is mastered, but the student is required to spend one hour each day at work in the shops. The first year is devoted to work in wood, in which the use of all the tools used in carpentry is brought into requisition, and all the forms of work in framing and carpentry are reproduced from blue prints of drawings which the pupils have been required to construct. The second year is devoted to work in the blacksmith shop. Here every form into which iron is wrought and every process with which the skilled smith must be acquainted, is repeated. The testing of all such work as to exactness of size and accuracy of form has as much educational value as the correct solution of a problem in algebra or geometry. The third year is devoted to vise and machine work. The fourth year is devoted to the manufacture of tools and to the higher forms of work in the machine-shop. Some useful machinery, including a fifteen-light dynamo, is now under construction by this class. When the student has completed this course of instruction, if he devotes his attention to farming, he is prepared, with the outlay of about forty dollars, to repair and to keep in order the machinery of the farm. He learns how to care for and to manage machinery. This to-day is one of the most important problems to every farmer, and is no less useful than a knowledge of the science of agriculture. Especially is this true as to the value of the services of the farm laborer. In the mechanical department is laid the foundation for the thorough mastery of all great mechanical industries. Here are educated men who may readily become skilled in any of the great mechanical pursuits. Here are prepared men not only to be artisans, but to become managers of great business industries. They do not simply learn a trade as an apprentice, but they learn the philosophy of what they do as it never was taught to the apprentice in the most palmy days of apprenticeship. It is well known that the days of apprenticeship are past. Two things stand in its way: First, labor unions practically control the employment of apprentices by limiting the num-

ber; second, by the division of labor in all the great manufacturing industries, there is no necessity nor desire to teach all the parts of any great industry; it is more remunerative to the manager to hold the laborer to that kind of work which he can perform with the greatest skill. Hence the study of mechanical industries is essential to the State.

The department of household economy and hygiene is an important factor in our college work. Here the young women spend an hour each day in studying the art and philosophy of household economics. Sewing, millinery, dressmaking and fitting, and the chemistry of cooking, are among the subjects practically taught: while social etiquette and the laws of hygiene and the care of the sick are not neglected. The training in this department is exceedingly valuable, because neatness and correctness are required in all its steps. To the State, no more important work can be done than to cultivate those habits which should prevail in every household. Economic habits, cultured taste, and nobility of character are the elements which go far to make and to keep the home happy. The happy home is the prosperous home. Upon such homes rest the perpetuity of the Republic.

Two other departments have been added since the last report was made to the Legislature; photography and photo-gravure, and printing. In each, much interest has been manifested, and the classes are larger than our acommodations warrant. Photography is important to the student for its educational value in applying his knowledge of chemistry and physics, while for its esthetic culture it is invaluable. Photography is no longer to be regarded as a secret art, nor is a knowledge which is so valuable, and a means which adds so much to human happiness and pleasure, to be overlooked in a course of study. Aside from its educational value, it is almost a necessity in the scientific work of the station.

Many young men are practically unfitted, by nature or by accident, for work either on the farm or in the mechanical pursuits. For this class it was believed that printing would be a valuable line of work. It has not been restricted to that class, however. Young men and young women both have been admitted to this class of work. This is not only valuable as a trade, but it has within it a great educative value. The training in spelling, composition, punctuation, and in all the other lines of English is exceedingly valuable. The first class in printing was organized this year, and its progress has been very commendable.

LABORATORY PROCESSES.

That we learn to do by doing has become an axiom in educational literature. In the Agricultural College, practically, all the

work is tested by the laboratory process. In physics, chemistry, mechanics, drawing (freehand and mechanical), botany, zoölogy, physiology, surveying and engineering, English, household economy, and in all the agricultural and mechanical, and horticultural processes this method is fully carried out.

The military discipline required in the Agricultural College is of high educational value; in this, that it requires prompt and instantaneous obedience, and perfect attention to the work in hand. The physical training is of great value, because it brings into play all the muscles, and the drill requires such positions of body as establish those habits not only graceful in themselves but most healthful to the student.

Last year this work was in the hands of Capt. C. H. Warrens, of the United States Army, retired. On his resignation, a detail was asked for from the Secretary of War. It was learned from him that in all coast States such details were to be made by the Secretary of the Navy. Our request was not granted by the Secretary of the Navy, on account of the need of all the naval officers then in the service. An officer will be placed in charge of this department as soon as he can be secured.

REQUIRED LABOR.

In this institution, which is in one sense an industrial school, each student is required to devote one hour each day to labor. The kind of labor depends upon the course which the student is pursuing. If he is in the agricultural course, then it includes all the kinds of labor which is done upon the farm or garden, thus putting into practice that which has been taught in the classes. He is required to make surveys for tile drainage as well as to take lessons in laying the tile; he sows the seed, notes the growth and development of the plant, and the fruitage; he is taught to graft, to bud, and to cultivate the tree or plant properly, as well as to prune and train it; and during the winter term he learns the art of carpentry and blacksmithing. If he is in the mechanical course, he learns the art and the philosophy of making all the forms of work in wood and metal, as was indicated above. If the student is pursuing the course in household economy, she is taught the art and science of sewing, dressmaking and fitting, canning, preserving and cooking. In addition to this, she is required to do work in household gardening, including grafting, budding, and flora-culture. If printing be the industry, then type-setting, proof-reading, press-work, etc., constitutes the labor.

Thus it will be seen that the work required of the student is along the line and in pursuance of the course which he has undertaken. The reasons for requiring work are the following:—

First—Because it is the best means of testing the work of the classroom.

Second—Because of the educative value which comes from enforced accuracy and neatness.

Third—Because the knowledge thus gained enables the student to acquire any trade or vocation readily when he leaves the school.

Fourth—Because it stimulates within the student self-reliance and a respect for physical labor. The student who looks upon physical labor as beneath his dignity, or who would show disrespect for the laborer because he is a laborer, is wholly unfitted for training in this institution.

Fifth—Because physical labor, and the practical knowledge of how to perform it, inspires the student with higher ideals of life and best fits him on graduation to compete with skilled labor.

Sixth—Because it enables him to become a more useful member of society.

STATISTICS.

The following tables of statistics show the enrollment of the school during the year 1891-2, and the first term of 1892-3.

	No. enrolled for the year 1891-2.	*No. enrolled for the first term 1892-3.*
Number of males enrolled	130	161
Number of females enrolled	78	94
Total enrolled	208	255
Classified by departments:—		
College department	122	181
Preparatory department	86	74
Totals	208	255
Classified by years of work:—		
Preparatory department	86	74
First year	63	121
Second year	28	36
Third year	19	14
Fourth year	9	8
Post-graduates	3	2
Totals	208	255
Classified by courses of study:—		
Preparatory department, agricultural and household economy	86	74
Agricultural course	29	39
Mechanical course	33	69
Household economy	48	66
Literary course	6	
Scientific course	3	5
Post-graduate course	3	2
Totals	208	255

The following table shows the number of students who under the Legislative enactment of 1885 have taken advantage of free scholarships therein provided, and also the number of free scholarships to which each county is entitled:

County.	*Free scholarship students in 1891 and 1892.*	*Free scholarship students now enrolled.*	*No. of free scholarships to be appointed by the county court.*
*Baker	3	3	2
Benton	4	4	4
*Clackamas	5	5	5
Clatsop	1		4
*Columbia	2	3	2
**Coos	2	4	2
††Crook			2
*Curry			1
Douglas	5	5	5
*Gilliam	3	2	2
**Grant			1
**Harney	1		1
Jackson	1	1	5
*Josephine			2
**Klamath	2	3	1
**Lake			1
Lane	5	3	6
Linn	6	6	6
*Malheur			2
*Marion	7	7	8
*Morrow	2	2	2
Multnomah	2	5	15
Polk	4	3	4
**††Sherman	1	1	1
*†Tillamook	1	1	1
*Umatilla		1	5
**Union	4	5	3
*Wallowa			2
**††Wasco	1	2	1
*Washington	1	2	5
†Yamhill	1	5	4
Total	63	74	105

NOTE.—The number of free scholarships to be appointed by Joint Senators or Representatives is 16, making the whole number of free scholarships 121.

The * preceding the name of the county indicates that another may be appointed by Joint Senator.

The † preceding the name of the county indicates that another may be appointed by the Joint Representative.

NEEDS OF THE STATE AGRICULTURAL COLLEGE.

An institution of learning, like any other undertaking, if successful, must be the outgrowth of some real necessity; and the lines of its growth must be in harmony with its environment. That the State Agricultural College has grown, and that it is in harmony with its environments, cannot be doubted after a careful investigation of its history, as exhibited by the statistics contained in this report. The reörganization of this College in 1888 marks a mile-

stone in its history. It then began to assume its proper sphere, and to come into harmony with the purpose of its existence.

The plans adopted in its organization demanded time for their development. It was necessary that the class should commence at the very beginning, and pass step by step through all the processes to an agricultural and industrial education before the method adopted could be fully tested and the necessary adjustments made. The period of reädjustment from a literary and classical school to an agricultural, mechanical, and industrial school has been almost completed. In June next, the first students will graduate from the mechanical course. The reörganization referred to above was an internal reörganization, the reärranging of courses of study, the organization of new departments, and the gradual introduction of industrial work. This not only demanded time for its execution, but required the greatest care to prevent violent reäctions while changing from an institution of one character to that of another. That period is, however, wholly passed.

In addition to this change in the character of work to be done, a still greater problem has constantly presented itself—the organization of what may be termed the externals of the College. Buildings adapted to the new purposes of the institution must be erected, laboratories must be fitted up, cabinets collected, machinery provided for carrying on the industrial work, green-houses constructed and the contents gathered, silos built, stock for experimenting secured, plants, shrubs, trees, grasses, and grains provided before any work in experimentation could be undertaken. This work of organizing the several departments went on simultaneously with the reconstruction of the internal work of the institution. It requires many buildings and much expensive apparatus to carry into effective operation such a school. The National Government practically furnishes the means for carrying on the internal work of the school, and has wisely left it to the State to furnish the plant and the means for their application. Only a very small part of the magnificent endowment which comes from the General Government can be used for the erection of buildings, the fitting up of laboratories, and securing the apparatus necessary for the school. These equipments the State has furnished in the past as rapidly possibly as the needs of the school required; but the institution has outgrown its earlier necessities, and now rightly makes far greater demands upon the State. The period of experiment is passed, and there is now every evidence that the school is needed and demanded by the people. That it is in happy relationship with its environments is evidenced in its growth since 1888, as will be seen by the following table:

Year.	Preparatory.	First year.	Second year.	Third year.	Fourth year.	Post-graduate.	Total.
1888-89	36	33	14	14	0	0	99
1889-90	67	55	17	6	0	6	151
1890-91	76	83	24	15	0	3	201
1891-92	86	63	28	19	9	3	208
1892 to January, 1893	74	121	36	14	8	2	255

The above shows a constant growth all through this period of reconstruction and reädaption. From ninety-nine students in 1888, it has now reached two hundred and fifty-five, a gain of almost 260%; while it will also be observed that the College department has increased almost 300%, and the preparatory only 200%. These are evidences of a healthful growth; and as the character and purposes of the school become better known throughout the State, its growth will not be less marked. In 1888, the College had representatives from only eight counties; in 1891, from fifteen counties; and, at present, twenty-five of the thirty-one counties are represented, as will be seen by the following table:

COUNTIES NOW REPRESENTED IN THE AGRICULTURAL COLLEGE.

Counties.	Agricultural department.	Mechanical department.	Household economy.	Bachelor of Science.	Preparatory department.	Total.
Baker	2	1	1	0	2	6
Benton	10	24	43	5	33	115
Clackamas	2	2	3	0	1	8
Clatsop	0	0	0	0	0	0
Columbia	1	3	0	0	1	5
Coos	2	1	0	0	3	6
Crook	0	0	0	0	0	0
Curry	0	0	0	0	0	0
Douglas	4	5	3	0	8	17
Gilliam	0	1	1	0	2	4
Harney	0	0	0	0	0	0
Grant	0	0	0	0	1	1
Jackson	1	0	0	0	0	1
Josephine	0	0	0	0	0	0
Klamath	1	2	0	0	0	3
Lake	1	0	0	0	0	1
Lane	1	1	3	0	3	8
Linn	5	5	6	0	7	23
Malheur	0	0	0	0	1	1
Marion	0	6	4	0	4	14
Morrow	0	1	0	1	0	2
Multnomah	0	2	0	0	3	5
Polk	3	1	1	0	0	5
Sherman	0	1	0	0	0	1
Tillamook	1	0	0	0	0	1
Umatilla	0	0	0	0	1	1
Union	4	7	1	1	1	14
Wallowa	0	0	0	0	0	0
Wasco	0	0	0	0	2	2
Washington	1	2	0	0	0	3
Yamhill	3	2	0	0	0	5
Washington (State)	0	2	0	0	0	2
Totals	39	69	66	7	74	255

This table also shows the department in which the student is at work, as well as the number of students from each county.

That the school is in harmonious relationship with its environment will be further fully demonstrated by an examination of the occupations of the parents of those who attend the school. All classes are here represented: Agriculture, 69%; laborers (unclassified), 6%; mechanics, 6%; merchants, 8%; physicians, 1%; ministers, 1%; lawyers, 2%; other professions, 7%; total, 100%.

When it is remembered that the buildings, apparatus, laboratories, etc., were prepared to acommodate only a very limited number of students, it will be seen at once that the school has outgrown its accommodations. Your attention is here called to the special needs of the school; and it would be difficult to say that any one is the least pressing:—

First—The station building which has been contemplated, and which has been partly constructed in order to relieve the pressing necessity for room, in the past, should be completed. This would give room in the College building for the proper accommodation of the College classes. This new building should contain the chemical, physical, and zoölogical laboratories, and the musuem, which, thanks to the friends of the institution, is rapidly growing, and far exceeds the capacity of the room in which it is stored.

Second—The mechanical department is now more than crowded with students in the mechanical course, and is wholly inadequate to meet the demands for training the agricultural students in the arts of woodwork and blacksmithing during the winter term. This is too essential a part of our work to be neglected. The building ought to be greatly enlarged, and the machinery duplicated. This department cannot afford to be crippled in its usefulness. Now but little attention can be given to electrical engineering; yet this is of the utmost importance to the State. Electrical plants are being everywhere established throughout the State. It is only a question whether Oregon shall import electrical engineers from abroad to develop and to utilize the power of her water-courses, now almost wholly unused, or whether the Oregon boy shall be given a chance. It is only a question of time when our rivers will furnish not only all the light for our cities and towns, but the motor-power of all our great industries. This department should be established at once, in order to keep peace with our sister States and the progress of civilization.

Third—The horticultural department needs additions to its workrooms and green-houses, as well as increased appliances. It covers a wide field of investigation for the benefit of the State, as will be seen under the head of that department in this report; and it is

doing a work that is exceedingly valuable, and hence should receive a liberal appropriation.

Fourth—The agricultural department is embarrassed for want of the proper means for prosecuting its work. The farm is doubtless sufficiently large for all our needs at present or the near future. But the purpose of such a farm is to demonstrate what can be done by good farming. Unless this is attempted, then it were better to dispose of the farm, and to turn our attention to some other field of industry. To attain reasonable results, a large part of the farm should be tile-drained. It is perhaps not more in need of this than most farms both in this and other parts of the State. For this reason, the question of thorough and systematic drainage becomes that much the more important. Up to this time no systematic plan of drainage has been attempted. If this institution is to be of real benefit to the farmers of Oregon, then our farm, which is devoted to experimental work for the general good of the State, must undertake that kind of work which will lead up to successful and practical farming. This necesssarily involves the thorough drainage of a large part of the farm. Then by contrast can be shown the advantage in farming well drained lands. In this way only can the friability and productiveness of well drained soils be shown. In this way only can it be demonstrated that the seasons can be lengthened and the kinds of crops increased. There are no difficulties in the way of thorough drainage; the outlets are easy, and the work is not needlessly expensive. It can be demonstrated in this way that drainage pays a large interest on the money invested. In addition to this, we need the work in order to illustrate to the students how to drain and how to lay tile-drains, as well as to show the effect on the growing crops, and to increase the kinds of crops that may be produced.

The extension of the barn is made necessary in order to provide room for the products of the farm as at present managed, and the erection of an additional silo is a necessity.

A dairy should be added to the agricultural department. It should not be such a dairy as would be established by an individual for the purpose of carrying on the dairying business, but a model dairy —one just large enough to meet expenses, and where students could be taught and have illustrated the principles of dairying. Might not such an education make it possible for Oregon to become self-dependent, and to furnish her own butter and cheese? If profitable farming is to take the place of the slothful; if men are to be shown how to make small farms pay; if they are to be encouraged to give up the idea of wheat culture alone; if they are to be induced to give up the thought that to raise herds of stock upon ranches of

immense proportions is the chief and only road to success, then the manner of the better method on small farms must be illustrated. They must be taught by example that they do not need to own one thousand acres of land before they can make a competence upon a farm, and that they can make a good living far more certainly and easily on the small farm when well managed. Hence all the processes of small farming, including dairying, fruit-raising, and horticulture in general, should be inculcated. The importance of silos in preserving green feed through the winter and the dry season, methods of fertilizing the farm lands, the results of thorough drainage—in short all the methods of securing the largest possible returns from farm lands, must be thoroughly inculcated.

The chemical, physical, zoölogical, and agricultural laboratories are now much too small for the number of students engaged, When these are placed in the new building, they should be made sufficiently large to meet our present needs and those of the immediate future.

REQUIREMENTS.

For the station :—		
Building	$15,000 00	
Heating, plumbing, ventilation	2,500 00	
Extra apparatus	2,500 00	
		$20,000 00
Mechanical Department :—		
Building	$ 9,000 00	
Additions, boiler and engine	1,500 00	
Lathes	1,500 00	
Carpenter tools, 25 sets	750 00	
Forges, 12	800 00	
Apparatus for drawing, etc	550 00	
Electrical apparatus	1,000 00	
		$ 15,000 00
Horticultural Department :—		
Work room, tool room, potting shed	$ 1,500 00	
Extra tools and repairs	350 00	
		$ 1,850 00
Agricultural Department :—		
Barn and silo	$ 2,000 00	
Tile drainage	1,500 00	
Dairy	2,000 00	
Implements	500 00	
		$ 6,000 00
College :—		
Heating college and girls' dormitory	$ 4,000 00	
Desks, chairs, tables, etc.	1,050 00	
Repairs on college property	1,500 00	
		$ 7,050 00
Total		$ 50,000 00

JOHN M. BLOSS,
President State Agricultural College.

REPORT OF THE TREASURER.

To His Excellency, Sylvester Pennoyer, Governor of Oregon:—

DEAR SIR: We, the special committee of the Board of Regents of the State Agricultural College, to whom was referred the duty of

examining and reporting on the accounts of the Treasurer of the State Agricultural College, beg to report as follows:—

We have considered the summary of expenditures and receipts furnished us by the Treasurer, Mr. A. R. Shipley, a copy of which is hereunto attached, and we have examined the Treasurer's books and the vouchers submitted by him. We find the books well kept, and that they correspond with the vouchers produced. And we report that the summary so attached hereto correctly shows the receipts and payments of the said Treasurer between the twenty-fourth day of June, 1891, and the twenty-eighth day of June, 1892.

Very respectfully,

W. P. KEADY,
W. A. SAMPLE,
Committee.

SUMMARY OF COLLEGE RECEIPTS AND DISBURSEMENTS

For the year July 1, 1891, to June 30, 1892.

RECEIPTS.

To cash	$ 1,713 30	
State of Oregon interest on land grant	9,717 42	
U. S. Government (Morrill Act)	17,000 00	
Tuition	1,587 00	
Farm and garden produce	745 85	
Miscellaneous receipts	203 39	
		$ 30,966 96

DISBURSEMENTS.

Advertising and printing	$ 210 28	
Current expenses	377 51	
Freight, express and drayage	347 75	
Insurance	715 00	
Library	283 66	
Sanitary	350 00	
Miscellaneous	109 15	
Electrical and other apparatus	1,401 59	
Scientific apparatus instruments	275 15	
Postage, stationary and telegrams	124 15	
Repairs and betterments	577 82	
Salaries	21,307 09	
Traveling expenses	709 28	
Machinery and tools	131 33	
Mechanical	405 63	
Labor	1,087 05	
Household economy	669 31	
Wood for fuel	437 15	
Supplies	268 00	
Clearing land	93 65	
Printing department	1,087 41	
		$ 30,966 96

Report of the Treasurer of said institution to the Secretary of Agriculture and the Secretary of the Interior, of the amount received under Act of Congress of August 30, 1890, in aid of Colleges of Agriculture and the Mechanic Arts, and of the disbursements thereof, to and including June 30, 1892 :—

December 10, 1890, date of receipt of first installment	$ 15,000 00
May 27, 1891, date of receipt of second installment	16,000 00
Total received by institution to June 30, 1891	$ 31,000 00
Balance on hand July 1, 1891	None.
September 25, 1891, third installment	$ 17,000 00
Total available for year ending June 30, 1892	$ 17,000 00

DISBURSEMENTS THEREOF FOR AND DURING YEAR ENDED JUNE 30, 1892.

In agriculture, as per schedule A	$ 1,700 00
In mechanic arts, as per schedule B	3,810 94
In English language, as per schedule C	2,370 00
In mathematical science, as per schedule D	2,189 75
In physical science, as per schedule E	2,100 00
In natural science, as per schedule F	2,200 00
In economic science, as per schedule G	2,629 31
Balance remaining unexpended July 1, 1892	None.

I hereby certify that the above account is correct and true, and together with the schedules hereunto attached truly represents the details of expenditures for the period, and by the institution named, and that said expenditures were applied only to instruction in agriculture, the mechanic arts, the English language, and the various branches of mathematical, physical, natural and economic science, with special reference to their application in the industries of life and to the facilities of such instruction.

(Signed), A. R. SHIPLEY,
Treasurer.

SCHEDULE A.

Disbursements for instruction in agriculture, and for facilities for such instruction, during the year ending June 30, 1892.

First—For instruction, viz:—	
For salaries of H. T. French, agriculturist	$ 1,100 00
For salaries of George Coote, horticulturist	600 00
For facilities, as follows:—	
1. Apparatus	
2. Machinery	
3. Text books and reference books	
4. Stock and material	
Total	$ 1,700 00

SCHEDULE B.

Disbursements for instruction in mechanic arts, and for facilities for such instruction, during the year ending June 30, 1892.

First—For instruction, viz:—	
For salaries of G. A. Covell	$ 1,700 00
For salaries of E. M. Belknap	780 00
For salaries of H. R. Clark	600 00
Second—For facilities, as follows:—	
1. Apparatus	
2. Machinery	87 81
3. Text books and reference books	
4. Stock and material	643 13
Total	$ 3,810 94

SCHEDULE C.

Disbursements for instruction in English language, and facilities for such instruction, during the year ending June 30, 1892.

First — For instruction, viz.:—	
For salaries of B. L. Arnold	$ 1,600 00
For salaries of J. B. Horner	770 00
Second — For facilities, as follows:—	
1. Apparatus	
2. Machinery	
3. Text books and reference books	
4. Stock and material	
Total	$ 2,370 00

SCHEDULE D.

Disbursements for instruction in mathematical science, and facilities for such instruction, during the year ending June 30, 1392.

First — For instruction, viz.:—	
For salaries of J. D. Letcher	$ 1,900 00
Second — For facilities, as follows:—	
1. Apparatus	289 75
2. Machinery	
3. Text books and reference books	
4. Stock and material	
Total	$ 2,189 75

SCHEDULE E.

Disbursements for instruction in physical science, and for facilities for such instruction, during the year ending June 30, 1892.

First — For instruction, viz.:—	
For salaries of G. W. Shaw	$ 1,100 00
For salaries of Dumont Lotz	500 00
For salaries of E. F. Pernot	500 00
Second — For facilities, as follows:—	
1. Apparatus	
2. Machinery	
3. Text books and reference books	
4. Stock and material	
Total	$ 2,100 00

SCHEDULE F.

Disbursements for instruction in natural science, and for facilities for such instruction, during the year ending June 30, 1892.

First — For instruction, viz.:—	
For salaries of Moses Craig	$ 1,100 00
For salaries of F. L. Washburn	1,100 00
Second — For facilities, as follows:—	
1. Apparatus	
2. Machinery	
3. Text books and reference books	
4. Stock and material	
Total	$ 2,200 00

SCHEDULE G.

Disbursements for instruction in economic science, and for facilities for such instruction, during the year ending June 30, 1892.

First — For instruction, viz:—	
For the salary of Miss M. C. Snell, M. D.	$ 1,700 00
Second — For facilities, as follows:—	
1. Apparatus	260 00
2. Machinery	
3. Text books and referenee books	
4. Stock and material	669 31
Total	$ 2,629 31

Oregon Experiment Station.

REPORT.

CORVALLIS, OREGON, January 4, 1893.

To His Excellency, Sylvester Pennoyer, Governor of Oregon:—

SIR: As provided in section 5 of the Act of Congress usually called the "Hatch Experiment Station Act," we beg to submit to you the report of the operations of the Oregon Experiment Station for the year commencing July 1, 1891, and also a report of the receipts and expenditures on Station account during the financial year expiring June 30, 1892.

Very respectfully,

WALLIS NASH,
Secretary of the Board of Regents.

AGRICULTURAL EXPERIMENT STATION FUND.

Report of the special committee of the Board of Regents to the annual Board meeting, held at Corvallis, Oregon, June 28, 1892.

To His Excellency, Sylvester Pennoyer, Governor of Oregon:—

SIR: We, the special committee of the Board of Regents of the State Agricultural College, to whom was referred the duty of examining and reporting on the accounts of the Treasurer of the State Agricultural College, who is also the Treasurer of the Hatch Experiment Station Fund, beg to report as follows: We have considered the summary of expenditures and receipts furnished us by the Treasurer, Mr. A. R. Shipley, a copy of which is hereunto attached, and we have examined the Treasurer's books, and the vouchers submitted by him. We find the books well kept, and that they correspond with the vouchers produced. And we report that the summarys attached hereto show the receipts and payments of the said Treasurer of and relating to the Hatch Agricultural Experiment Station Fund between the twenty-fourth day of June, 1891, and the twenty-eighth day of June, 1892.

Very respectfully,

W. P. KEADY,
W. A. SAMPLE,
Committee.

STATEMENT OF RECEIPTS AND DISBURSEMENTS

July 1, 1891, to June 30, 1892.

RECEIPTS.

1891, September 11, cash from United States Government	$ 3,750 00	
October 5, cash from United States Government	3,750 00	
1892, January 15, cash from United States Government	3,750 00	
May 28, cash from United States Government	2,541 71	
June 28, cash from United States Government	1,207 59	
Balance from 1890–1891	70	
		$ 15,000 00

DISBURSEMENTS.

Fencing and drainage	$ 205 24	
Tools and machinery	297 38	
Labor	3,784 57	
Food for stock	351 41	
Freight, expressage and drayage	297 38	
Incidentals	215 35	
Library	257 27	
Postage	68 95	
Supplies	859 26	
Salaries	6,434 98	
Scientific instruments	375 71	
Live stock	260 00	
Apparatus, (chemical)	349 51	
Institutes	297 10	
Meteorology	238 85	
Bulletins	452 65	
Miscellaneous	91 80	
Moving piggeries	50 00	
On account fittings chemical laboratory	105 22	
		$ 15,000 00

STATEMENT OF DISBURSEMENTS BY DEPARTMENTS

For the year ending June 30, 1892.

AGRICULTURE :—		
Fencing and drainage	$ 205 24	
Labor	1,854 47	
Tools and machinery	166 49	
Food for stock	248 21	
Freight, expressage and drayage	46 22	
Incidentals	103 72	
Library	6 80	
Postage	22 60	
Supplies	155 78	
Scientific instruments	16 80	
Live stock	260 00	
Salaries	1,320 00	
		$ 4,406 33
HORTICULTURE :—		
Labor	$ 1,711 00	
Tools and machinery	124 88	
Food for stock	103 20	
Freight, expressage and drayage	11 95	
Incidentals	55 25	
Postage	5 00	
Supplies	201 09	
Salaries	600 00	
		$ 2,812 37
CHEMISTRY :—		
Apparatus and supplies	$ 349 51	
Labor	120 90	
Freight, express and drayage	156 65	
Library	57 14	
Postage	13 40	
Supplies	226 86	
Scientific instruments	247 46	
Salaries	1,100 00	
		$ 2,271 92

ENTOMOLOGY:—			
Scientific instruments	$ 64 20		
Labor	68 20		
Tools and machinery	6 01		
Freight, expressage and drayage	70 93		
Incidentals	11 30		
Library	94 36		
Postage	15 95		
Supplies	212 75		
Salaries	600 00		
		$	1,143 70
BOTANY:—			
Scientific instruments	$ 47 25		
Labor	30 00		
Freight, express and drayage	19 00		
Incidentals	45 08		
Library	98 97		
Postage	12 00		
Supplies	62 78		
Salaries	600 00		
		$	915 08
INSTITUTES	$ 297 10	$	297 10
METEOROLOGY	238 85		238 85
BULLETINS	452 65		452 65
MISCELLANEOUS	91 80		91 80
SALARIES:—			
A. R. Shipley	$ 563 15		
Wallis Nash	500 00		
H. R. Clark	399 85		
Robert Erwin	325 00		
P. H. Irish (back pay)	118 73		
B. L. Arnold	266 60		
John M. Bloss	41 65		
		$	2,214 98
Paid for moving piggeries	$ 50 00		
Paid on account fittings chemical laboratory	105 22	$	155 22
Total		$	15,000 00

STATE AGRICULTURAL COLLEGE OF OREGON.

BOARD OF REGENTS.

W. S. Ladd, President, Portland.

T. E. Cauthorn, Treasurer and Chairman Executive Committee, Corvallis.

Wallis Nash, Secretary, Corvallis.

Governor Sylvester Pennoyer, Salem (*ex-officio*).

Secretary of State George W. McBride, Salem (*ex-officio*).

Superintendent of Public Instruction E. B. McElroy, Salem (*ex-officio*).

Master of State Grange H. E. Hayes, Oswego.

J. T. Apperson, Oregon City.

John Emmett, Umpqua Ferry.

J. W. Grim, Aurora.

W. P. Keady, Portland.

A. R. Shipley, Oswego.

J. K. Wetherford, Albany.

REGULATIONS

Governing that Department of the State Agricultural College of Oregon which is known as the Oregon Agricultural Experiment Station.

Adopted by the Board July 25, 1889.

1. The Board of Regents has executive control of the Station; is responsible for its expenditures; apportions the income among the several departments of the Station; elects the members of the working force; orders and directs, in general terms, the nature of the scientific work to be undertaken by the working force, in its various departments, and assumes, from time to time, such other duties as may appear to the Board to be involved in, or arise from any of the foregoing items, including the establishments of branch stations in various parts of the State.

2. A Station Council is hereby created, consisting at first of the President of the College, the Director of the Station, and the agriculturist, botanist, and chemist of the Station force. Changes or additions may be made by the Board of Regents from time to time as fresh departments are added to the Station force, or reärrangements effected therein.

The President of the College is *ex-officio* the President of the Station Council, with the powers and functions in carrying on the business of the Council usually attached to the office of President. He is the official representative of the Station Council in its relations with the Board of Regents.

THE FUNCTIONS AND DUTIES OF THE COUNCIL.

Are—*a.* To prepare plans of scientific work and to submit same to the Board of Regents, with financial estimates for carrying the same out.

b. When such plans shall have been approved by the Board of Regents, to apportion the same among the members of the working force, and to submit to the Board periodical reports of the progress of the same.

c. To prepare and submit to the Board quarterly the drafts of the bulletins which are by law demanded from the Experiment Station, and when the same have been printed, to see the due publication of the same.

d. To promote in all practicable ways farmer's institutes in various parts of the State of Oregon, held uuder the direction of the State Agricultural College.

3. The Director of the Station shall maintain a general and daily oversight of the various departments, and report the condition of the work to the Station Council.

He shall examine and certify all requisitions for purchase demanded, and all vouchers for payments needing to be made by the departments. He shall cause to be kept, and shall be responsible for the accuracy of all Station labor accounts. He shall have charge of the Station correspondence, except in cases where the Council may apportion such correspondence among other members.

4. Each member of the Station force shall be independent in, and responsible for the work of his own department, receiving and carrying out the general instructions from the Station Council, and furnishing such periodical reports of the progress of work as he may from time to time be requested to supply. When supplies or outfit are needed, the particulars shall be shown on a written requisition, signed by the head of the department, and by him handed to the Director. All accounts or invoices for such supplies or outfit shall be procured by the head of the department in question, and, if correct, shall be so certified by him, and handed to the Director.

WALLIS NASH,
Secretary.

Corvallis, June 25, 1889.

RFPORT OF THE EXPERIMENT STATION.

Hon. W. S. Ladd, President Board of Regents, State Agricultural College:—

My Dear Sir: The attention of the Board of Regents is called to the following reports of the several departments of the Experiment Station.

These reports cover a period of two years, and show in a condensed form what has been done, and to some extent foreshadows what will be attempted in the future. Of course, only a resumé has been undertaken.

The station is of comparatively recent origin, and sufficient time has not been given to carry many of the experiments which are now under way to completion; yet it will be found that commendable progress has been made in all the departments.

It will be observed that a wide range of work has been undertaken, all of which will be of great interest to the State.

DEPARTMENT OF AGRICULTURE.

President John M. Bloss, Director of the Station:—

Dear Sir: I herewith submit a condensed report of the work done in the agricultural department of the Station since 1890, and also a report of the work now in progress, and of that contemplated.

Since January, 1890, six bulletins have been issued by the department, embracing the following subjects:

No. 4. Notes on farm crops;
No. 8. Notes on varieties of wheat and flax;
No. 9. Silos and silage;
No. 11. Notes on grasses and potatoes:
No. 16. Notes on varieties and yield of wheat;
No. 20. Experiments in pig-feeding.

Experiments were undertaken by the department in 1889-90 with a view to testing the effect of our climate and soil in the production of grasses and clovers for hay and pasturage. Plats were put out on the white land and that adjacent to it. While in many instances definite results were not reached, it has been satisfactorily proved that the more hardy grasses and clovers will give good returns upon the white land, when well drained and thoroughly cultivated. Of all the subjects upon which questions have been asked, there are none of more interest than those regarding this land, hitherto considered unprofitable. The problem has not yet been solved; but from our experience and observation it can be safely said that tile-drainage must precede any permanent improvement in managing this kind of soil. The air must be brought into contact with the inert material; to do this the water must be drawn off below, so that the life-producing air may follow in its wake. Orchard grass, tall oat grass, and tall fescue have produced from one and one half to two tons of hay per acre on white land that had been partially drained. Clover has produced two tons per acre on such lands. Red-top (*Agrostis vulgaris*) and creeping bent grass (*Agrostis stolinifera*) have also done well upon white land. *Agrostis stolinefera* has withstood pasturing better than any other grass. This is an important point gained in regard to the utility of this land. Other varieties have been tested for yield of hay and pasturage, the results of which were published in bulletin No. 11. Gypsum was applied to clover in plats and in the field. The results show that the fertilizer more than doubled the crop.

In 1890-91 there were seventy-one varieties of wheat grown in plats on the farm, for the purpose of securing varieties which would surpass those then grown in this State. Out of this large number, four or five have been recommended for trial, and seed has been

furnished to those farmers who have applied. About two hundred packages of seed have been distributed throughout the State. From reports received we have reason to believe that this will prove to be of great value to the State in increasiug the quality and yield of the wheat crop.

Similar experiments have been made with oats. There has been less demand for new varieties of oats than wheat.

Four hundred, so-called, varieties of potatoes were grown in plats for the purpose of testing their merits as to quality and yield. If, after a trial of two or three years, any have proved better than the standard sorts, they have been sent out for trial to farmers. About three hundred trial packages of one pound each were thus distributed during the spring of 1892. Reports so far as received show that some of these varieties will add very materially to the yield and quality of the potato crop of the State.

Forty varieties of corn have been tested, with the purpose of securing a variety which is adapted to the climatic conditions of this valley. The results show that the varieties grown in the Southern States will not reach maturity in this climate, except under the most favorable circumstances. The medium-sized, early maturing, yellow dent varieties have given the best results both in grain and fodder. The type of corn represented in the variety known as "The Pride of the North" is one of the best both for grain and silage.

Twenty varieties of sorghum have been tested for two years in succession, with no favorable results so far as maturing is concerned. The "Early Amber" variety is the only one which approached maturity; and this never reached a stage that would warrant its use in the production of syrup. As a fodder plant, sorghum has several advantages. One of the most prominent advantages is its power to withstand the dry season. It roots deep and grows until frost comes. It has been fed to stock with very good results. The silo has been in practical use on the farm since 1889, and has demonstrated its great usefulness in furnishing a means for curing fodder in a climate where it is very difficult to cure green material by the ordinary process. The farm has been enabled by the use of the silo to maintain a succulent ration for dairy stock when all other sources have failed. It also enables the farmer to keep a larger number of animals on a less area than by any other means. Experiments in pig-feeding were begun September 1, 1891. The object was to test the value of feed materials grown in this State in producing pork; also, to test the value of ground and unground feed. In the Eastern States some of these points are well established; here, there has been a lack of careful experimentation along this line. Comparatively little

attention has been given to the improvement and care of pigs in this State.

The results obtained in these experiments are not conclusive, yet they will serve as a guide for future work. It was reasonably well established that it is not profitable to feed whole oats or wheat in fattening pigs. Again, it was shown that it was possible to mature the pigs at a much earlier age than is commonly practiced in this State. These are a few of the most noticeable results reached in the experimental work of this department during the past two years. A more detailed account will be found in the bulletins mentioned at the beginning of this report.

A great deal of preliminary work has been necessary in bringing the farm into a proper condition for experimentation. The following experiments have been carried on during the past season:

1. Testing the yield of forty varieties of potatoes.
2. Fertilizer experiment with potatoes;
   (*a*) With Mexican guano;
   (*b*) With superphosphate;
   (*c*) With Mapes' potato fertilizer;
   (*d*) With nitrate of soda;
   (*e*) With kainit;
   (*f*) With wood ashes;
   (*g*) With gypsum;
3. Effect of wood ashes in preventing potato scab.
4. Effect of deep and shallow tillage on yield and quality of potatoes.
5. Tests of yield and quality of fifteen varieties of carrots and mangolds.
6. Yield of hay from large plats of grass and clovers sown in the fall upon the bare fallow.

EXPERIMENTS NOW IN PROGRESS.

1. Pig-feeding experiments are carried on again, with some changes suggested by the work of last year.
2. Plat experiments in testing grasses and forage plants; forty plants have been put out, and it is the intention to secure as complete a list of forage plants as can be obtained.
3. Plat experiments in growing a number of varieties of wheat which have never been tested in this State, along with some varieties of known excellence.
4. Testing the growth of wheat under the following conditions:
   (*a*) On bare fallow;
   (*b*) After corn;
   (*c*) After potatoes;

(*d*) After buckwheat;
(*e*) After beans;
(*f*) After oats;

Experiments showing the effect of through drainage and areation upon the clover and alfalfa.

CONTEMPLATED EXPERIMENTS.

1. Feeding experiments in testing the following:—
   (*a*) Oat grass;
   (*b*) Clover;
   (*c*) Mesquit;
   (*d*) Rye grass;
   (*e*) Orchard grass;
   (*f*) Cheat;
2. Feeding experiments testing the comparative value of silage made from:—
   (*a*) Corn;
   (*b*) Vetches;
   (*c*) Clover;
3. The continuation of plat experiments in growing grasses, grains, and vegetables, with a view of determining:—
   (*a*) Suitableness to climate and soil;
   (*b*) Yield and quality.
4. Systematic rotation of crops, to determine the exhaustive effects on the soil.
5. Experiments in dairying:—
   (*a*) Testing apparatus;
   (*b*) Testing food materials,
   (*c*) Testing individual animals;
   (*d*) Management of dairying to secure the best returns in Oregon.
6. Experiments in drainage:—
   (*a*) In acrating the soil;
   (*b*) In changing the color of white land;
   (*c*) In changing the composition of the soil;
   (*d*) In making white soil suitable for the growth of clover.

H. T. FRENCH,
Agriculturist.

HORTICULTURE.

President John M. Bloss, Director of Experiment Station :—

Dear Sir: I have the honor herewith to submit the following report of the work which has been carried on in the horticultural department during the past two years:—

Experimental orchard—The planting of an experimental orchard was begun in the spring of 1891. The purpose was to determine the hardiness of the trees, and the quality of the fruit when grown in this climate. The following number of varieties were planted: Apples, eighty-seven; grapes, fifty-seven; quinces, three; apricots, three; peaches, three; and filberts, three. Also, forty-four varieties of gooseberries were planted, to ascertain the varieties that would best resist the mildew, as well as to test the market value of each variety. A report of these experiments will be found in bulletin No. 22. Of raspberries, nine varieties; of currants, nine; and of blackberries nine varieties were planted to test their shipping qualities, as well as their flavor and productiveness.

Strawberries—During 1891 twenty-five varieties of strawberries were tested as to bearing qualities when planted in the hill and in the matted row. A report of the results will be found in bulletin No. 12. During the year 1892, the bearing qualities of three-year old and four-year old strawberry plants were tested. The results under like treatment were found to be in favor of the four-year old plants. The full report will be found in bulletin No. 22.

Tomatoes—During the spring of 1891 tests were made on fifty-five varieties of tomatoes. The objects were, first, to test the earliness of the varieties; second, to test their commercial value and comparative productiveness; third, to ascertain the best manner of training and pruning the vines, and, fourth, as to the best means of preventing the cut-worms from injuring the young vines. A full report of these experiments will be found in bulletin No. 15.

Cabbage—In 1891 a test was made of twenty-seven varieties of cabbage, to determine the earliness of edible maturity; and, in 1892, a similar test was made on thirteen similar varieties, a report of which will be found in bulletin No. 22.

Peas—In 1891 two varieties of peas were tested, viz: The "New Alaska" and the "First and Best," the object being to determine which was the hardier and the earliness of edible maturity. A report of these experiments will be found in bulletin No. 15. In 1892 twenty-five varieties, some of which had not been grown at this Station, were tested, the object being to determine the earliness of the varieties, height, and productiveness. The gophers interfered with the latter part of the experiment. The report of these experiments will be found in bulletin No. 22.

Currants—During the past three years experiments have been carried on to test the effect of pruning on the quality and productiveness of the red and the white currant. These experiments are reported in bulletin No. 22.

Gooseberries—Tests were made during the present year on the gooseberry, to determine whether the mildew could be prevented by spraying. It was found that by spraying with sulphide of potassium the whole crop could be saved. The report of this will be found in bulletin No. 22.

Old orchards—During the past three years an experiment has been made for the purpose of reclaiming an old orchard. This orchard has been planted for thirty-six years, and had probably never been pruned or otherwise cared for. The trees were covered moss; the tops were matted, and many of the limbs dead. After a test of three years, it has been fully reclaimed, the moss has disappeared, and the fruit has attained its wonted size, color, and flavor. This has been done simply by systematic pruning and the thorough cultivation of the soil. A full report of this will be found in bulletin No. 22.

All of which is most respectfully submitted,

GEORGE COOTE,
Horticulturist.

DEPARTMENT OF CHEMISTRY.

President John M. Bloss, Director of Oregon Experiment Station:—

Dear Sir: I have the honor to to submit the following report of work done in the chemical department under my direction since taking charge of the laboratory on July 5, 1891, and also outlining the work of the near future:—

Since there was found the most meager report of previous work done and of the plans under contemplation, it became necessary to outline a new field of investigation. After making the necessary reägents, considerable miscellaneous work which had accumulated in the laboratory was done, after which the regular lines of investigation were laid out and entered upon as follows:—

I—COÖPERATIVE SUGAR BEET EXPERIMENTS.

Object—The intention was to ascertain whether or not the conditions of this State were suited to the growth of beets for the manufacture of sugar; what soils were best adapted to their growth; the most economical methods of culture, as well as whether the farmer could produce the beets at a price which a factory could afford to pay.

Plan—Beets were grown by farmers in selected localities according to instructions sent out by the department. Beets were also grown on the College farm. Of the beets thus produced, ninety-six analyses were made last year.

Results—Since it was evident that in many cases instructions had not been so carefully followed as could be desired, and as there were farmers who did not send reports, only one of the above questions could be answered with much certainty. The result obtained, however, with those now at hand for this year's work, but not yet collated, will suffice to show with certainty much desirable information, not only to the farmer, but also to those interested in sugar production. There is probably no one industry which, added to those of our State, would be of such general advantage as the manufacture of sugar.

The summary of last year's work is here stated:—

Counties.	*No.*	*Averages sugar.*	*Purity.*	*Weight.*
Columbia	1	13.73	79.42	465.0
Clackamas	7	14.55	77.30	780.6
Benton	39	12.30	74.12	417.0
Douglas	9	12.99	78.45	1,009.3
Jackson	3	18.93	80.99	274.6
Lane	16	14.32	79.95	108.4
Linn	5	13.54	79.91	587.4
Marion	1	15.99	78.38	920.0
Polk	1	14.72	78.08	624.0
Union	3	15.84	79.89	658.3
Washington	11	13.96	78.79	115.4
Yamhill	1	10.73	76.64	975.0

The analyses had a wide range, from 6.77% to 22.44% of sugar in the juice. Of the ninety-five analyses, eight fell below 10% of sugar, seventy-six showing over 12%, thirty-seven over 14%. For the entire State, the average was 14.13%, with a purity of 78.08%. From the above it will be seen that beets containing a high percentage of sugar can be produced in this State. From the experiments of last year, this was the only conclusion that could be drawn, because of reasons given above, and from the fact that beets of different varieties were used in the experiment. The main question for the present year was: Given a climate and soil adapted to the growth of sugar beets, can the farmer raise them in such quantities and sell at such a price as to supply a factory at a price that it can afford to pay? Work is now in progress to determine this question. The main work in this line will be concluded this year, and at this time I can only say that the indications are even more favorable than last year for the profitable production of sugar. A very full report of the investigations with sugar beets was published in bulletin No. 17 of this Station, as well as a report on the climatic conditions bearing on this subject.

II—INVESTIGATION OF THE SOILS OF THE STATE.

(*a*) As to the chemical nature of the soils and irrigation waters;
(*b*) The effect of fertilizers on the typical soils with reference to the plant-food supply, and with special bearing on soil texture, particularly on adobe, white land, and alkali;
(*c*) Mechanical analysis of soils and its relation to texture;
(*d*) The circulation of water in the soils;
(*e*) Treatment of alkali;
(*f*) Best methods of improving the soils.

Plan—The plan is to conduct this work as rapidly as possible, both in the laboratory and by coöperative work with the farmers of the State, extending it over a large number of analyses for a series of years, and publishing results as soon as sufficient data are secured. Supplemental to this it is also intended to prepare a soil map of the State.

Results—Analyses of about thirty typical soils have been made chemically and in part physically. If we can judge anything from this number of analyses, the indications point towards a low supply of potash in the Willamette valley soils.

Intention—It is the intention of the department to extend these investigations during the year, paying especial attention to the physical conditions and to alkali soils.

III—MISCELLANEOUS.

The miscellaneous analyses made between July 1, 1891, and July 1, 1892, were as follows:

Analyses of mineral waters	2	
Sanitary examination of water	2	
Analysis of gypsum	1	
Analysis of water deposit	1	
Analyses of iron ores	4	
Analysis of coal	1	
Analyses of various minerals	6	
Total	—	17

To which may be added the following from the Food Commissioner:—

Analysis of butter	1	
Analysis of milk	1	
Analyses of baking powders	8	
Total	—	10
Total miscellaneous to July 1, 1892		27

This, with the sugar-beet and soil analyses, making a total of one hundred and seventy-seven analyses to that date, involving over two thousand determinations.

Since July 1, 1892, the following miscellaneous work has been done:—

Well waters analysed	3	
I. X. L. compound	1	
Minerals analysed	2	
Gypsum	1	
Total	—	7

From the Food Commissioner :—		
Bottled mineral water	1	
Milk	11	
Butter	3	
Total from Food Commissioner	—	15
Total miscellaneous		22
In regular lines of work :—		
Analyses of sugar beets	61	
Analyses of soil- partially mechanical	20	
Analyses of feeding stuffs	5	
Total	—	86
Total from July 1, 1892, to January 1, 1893		113

To which may also be added five samples of condensd milk not yet completed, making a total miscellaneous to January 1, 1893, of twenty-seven analyses.

The total value of work done for the Food Commissioner in the discharge of his duty, estimated at the usual price for such work, is $355. For this the department received no pay.

As to the other intended lines of work, I beg leave to state that there were experiments begun in 1890 to determine the following: The effect of climate and soil on the chemical composition of wheat—In connection with this line of work fourteen varieties were analysed by my predecessor, and the results published in bulletin No. 4 of this Station. It is intended to conduct this research further, extending it over a series of years, growing different varieties of wheat on the various soils, making analyses, and when a sufficient number have been made, tabulating the results, and drawing conclusions as to the merits of the varieties under the several conditions.

Experiments to determine the chemical valuation and comparative feeding value of the various cattle foods of the State—Some work has already been done along this line, the results of which are published in bulletin No. 5. It is intended to extend these investigations, and to include therein a thorough chemical study of the grasses and clovers of the State. Analyses are now being conducted in this work. The latter portion of the work will de done in conjunction with the botanist, who will at the same time classify these plants.

The above mentioned lines of investigation, together with the miscellaneous work which comes to the laboratory, will furnish sufficient employment for some time to come. Submitting the above report to you, I am, sir,

Yours very respectfully,

G. W. SHAW,
Chemist.

DEPARTMENT OF BOTANY.

President John M. Bloss, Director of the Experiment Station:—

Dear Sir: I have the honor to submit the following report on the condition of the botanical department:—

This department was first organized in 1888. Having been begun without either herbarium or apparatus, time was necessary for the collection of even a small herbarium and the necessary apparatus for laboratory work. To this primary organization a period of three years was wholly devoted by my predecessors. Commencing at the beginning, the constant endeavor has been to lay a foundation for future work by keeping careful records of what has been done. Circulars were prepared and sent to farmers, requesting information regarding troublesome and obnoxious plants. From this bulletin No. 19 was prepared, being an illustrated pamphlet of 48 pages, on "Some Oregon Weeds, and How to Destroy Them." It describes weeds most injurious to growing crops, the injury caused, and the best methods to prevent this injury. A large number of letters asking information about medicinal, weedy, and poisonous plants, plants best adapted to certain localities, various grasses, the causes, prevention, and cure of various plant diseases, etc., have been received and answered. These have been carefully filed, together with copies of answers returned. Nearly 200 plants have been sent to this department for determination, and full accounts have been returned of their properties, history, and habits. The herbarium has been built up, both by collection and exchange, the old cases extended, 100 new shelves added, and the entire collection rearranged and labeled according to recent botanical nomenclature. It is now the best college collection in the State. A large number of flowering plants and several hundred fungi have been mounted, and a large number of duplicates collected, named, and arranged during the last summer. A catalogue of accessions is kept, so that any plant can be readily found when needed. Exchanges, which will greatly enlarge the collection, are now being carried on with other botanists. Specimens of the most injurious and obnoxious weeds, the characteristic grasses, the economic fungi, and some typical plants of this State have been collected and sent to the committees appointed by the Association of Experiment Stations for the Columbian Exposition. For these due credit will be given to this Station. New cases have been built for instruments and supplies, thus greatly increasing the space available for the herbarium. Many other improvements have been made in the room, which is well adapted for the botanical laboratory.

Since October 1, 1891, this department has had charge of the mailing of bulletins for the Station. There were in 1891 about 1,800 names on the list; now there are about 5,000. The following outline of work intended to be done in this department of the Station is herewith submitted.

First—A study of the weedy and poisonous plants of Oregon, in order to find out the best method of remedying their ill effects, and to disseminate this information among the farmers of the State.

Second—A study of plant diseases, and their influence on cereals, vegetables and fruits. In view of the numerous requests for information regarding fungous diseases, a bulletin will be issued this winter on "Plant Diseases, and How to Combat Them." It is intended during the next spring to visit the principal vineyards and orchards of Benton and other counties, and carry on experiments with fungicides against the downey mildew of the grape, apple scab, peach and pear blight, etc.

Third—To make a study of the grasses and forage plants of the State in coöperation with the station chemist. This work has already been begun; the results, it is hoped, will be ready for publication next fall.

Fourth—A study of forest conditions; first, with a view of preventing the great waste of timber by means of forest fires; and, second, to introduce tree culture in the eastern part of the State.

Fifth—To make a collection for the herbarium of as many specimens as possible of Oregon plants, and by exchange to increase the working collection.

Sixth—To collect as many species and forms of parasitic fungi as possible, preparatory to cataloguing the rusts and mildews of the State.

The above work will require a number of years for its completion, and other lines may be taken up simultaneously with these.

This summary is given to show the general character of the work to be followed, subject, of course, to such modifications as exigency may require.

Respectfully submitted.

MOSES CRAIG,
Botanist.

DEPARTMENT OF ENTOMOLOGY.

President John M. Bloss, Director of the Experiment Station:—

DEAR SIR: Please find herewith a report of the work completed during the past two years, also of other work contemplated in the entomological department:

WORK COMPLETED.

Codlin moth—Experiments with the Codlin Moth have been continued, and a mixture of IXL water and Paris green has been found to be very effective, calling for fewer sprayings than anything tried hitherto, and proving to be comparatively inexpensive.

Wire worms and cut worms—Part of the six hundred pounds of kainit and muriate of potash donated the Station has been used against these pests, both at the Station and by a few trustworthy observers elsewhere. The season just past has been one in which wire worms and cut worms have done but little damage, hence no results have been recorded. Incidentally, it may be said that crops to which these salts were applied made a better growth than crops untreated.

The branch form of woolly aphis—This is one of our worst pests. It has been found that in spraying the fruit with IXL mixture for the codlin moth, as above referred to, the woolly aphis can be attacked successfully by spraying the colonies forcibly. While this does not exterminate them, it keeps them so completely in check that their ravages need not be feared. This spraying can be done at the same time that one sprays for codlin moth.

Hop louse—Bulletin No. 10 was issued in April, 1891, on this serious pest, giving the life-history, remedies, and observations of the entomologist on this pest in Oregon. Since then quite an extensive correspondence has been carried on with hop-growers. Many plant lice thought by them to be hop lice were sent to the Station, and frequently found to be species other than the hop louse. The best remedy used by our hop-growers as yet has been the quassia and soap solution, sprayed on the vines at intervals during the latter part of the growing season. Kerosene emulsion is also good as a spray, and has been used effectively, but its preparation and use requires such extreme care that the former remedy is safer for our hop-growers. Hops have been planted at this Station for experimentation.

Other plant lice—A number of other plant lice have been experimented with, and remedies found.

Gophers and moles—It has been found during the season that when the pocket-gopher finds no tender root crops in the fields, he

can be poisoned by placing powdered strychnine in small pieces of potatoes, and depositing them in their burrows. No absolute evidence other than that the digging was discontinued, is offered as to the success of this method. Of a large number of traps put on the market claimed to be good gopher traps only two were found to be effectual. Moles can be reached by both of these traps. The entomologist has personally witnessed a mole in captivity eating vegetables. Experiments have been made successfully in killing moles by placing small pieces of poisoned beefsteak in their burrows.

Caponizing cockerels—Twenty-four cockerels were caponized, and subsequently received the same treatment, as far as food, exercise, etc., were concerned, as other fowls of the flock. The above experiment having been carried on with the fowls of my own flock, the conditions were practically the same as they would be on the farm. In some of the Eastern markets capons bring 35% more per pound than ordinary chickens, and men engaged in the market business say that fancy prices can be obtained for caponized fowls on this coast. A capon recently killed at the age of eighteen months was found to weigh ten and one half pounds, and the meat was remarkably fat and tender. There is no noisy crowing or quarreling done by capons.

The grain-beetle—This pest was treated of in bulletin No. 5, and the remedy suggested there (fumes of bi-sulphide of carbon) was tried in the granary of Mr. Finley, near Corvallis, with success. Other instances of its successful use are reported.

Sugar-beet beetle—This pest was found to attack sugar beets at the College and elsewhere, and has been successfully combated with Paris green and water.

Five bulletins—Nos 5, 6, 10, 14, and 18, have been issued by this department. The first half of No. 6 was devoted to chemistry. In addition to other correspondence, over two hundred inquiries in reference to insects have been answered. The Station collection of Oregon insects now numbers more than two thousand specimens.

WORK PROPOSED.

1. Confirmation of this season's work with the codlin moth.
2. A continuation of experiments with potash salts against wire worm and cut worms.
3. Further observations on hop louse remedies, using as far as practicable, the vines planted this season.
4. Further experiments against the branch and root forms of the woolly aphis.
5. Further tests of traps and poisons against gophers and moles.
6. Further experiments in caponizing cockerels.

7. It is hoped to exhibit in the alcove for the exhibit of the United States Experiment Stations at the World's Fair, a collection of Oregon insects, machinery used in spraying fruit trees, traps used against gophers and moles, and specimens of these marauders; and also a number of photographs illustrating the work of the department.

8. A bulletin will be issued in March on "Work with the Codlin Moth;" "Results of Experiments with Gophers and Moles;" and "Notes on Hop-lice."

9. Later on, an illustrated bulletin will be issued on "Capons and Caponizing

It is not always possible to carry out all the work proposed, on account of unforeseen circumstances.

Respectfully yours,

F. L. WASHBURN,
Entomologist.

DEPARTMENT OF PHOTOGRAPHY AND ENGRAVING.

President John M. Bloss, Director of the Experiment Station :—

DEAR SIR: I herewith submit the following report:

The department of photography and engraving, which has been established in connection both with the College and the Station, is one of great importance to each, and since the time of its establishment has made rapid progress. In the College, photography is taught as an elective study to those who are in the third and fourth years' work. The following work has been done since this department was organized: One thousand eight hundred photographs appertaining to college work, including college scenery, and forty-two engravings for illustrating bulletins and college catalogues, etc., representing altogether a value of about $600, have been made. The demand for illustrations in the bulletins is increasing, and it is necessary that this work should be done. A large number of micrographs, lantern slides, and numerous illustrations of the work of the College and Station have been prepared by this department. Stereopticon slides have been made of experimental work in various scientific subjects for illustrating lectures.

A very important and useful feature of this department is the work of photo-micrography. Many specimens of diseased fruit trees, fruits, and vegetables are sent to the various departments of the Station to have the cause of the disease found and the remedy suggested. These come from all parts of the State. In many cases micrographs are made of sections of the diseased parts and placed in contrast with micrographs of corresponding healthy growths.

These micrographs are returned to the inquirer with suggestions for treatment. This is important, because it leads up to a proper study of disease. The importance of this department has been demonstrated, although the conveniences and opportunities for work are very limited. The needs of this department are: Suitable apartments, an enlarging and reducing camera-stand, and other articles; the equipment for engraving is incomplete, and many things are needed to take the place of those that are now improvised.

Respectfully submitted,

E. F. PERNOT.

All of which is most respectfully submitted.

JOHN M. BLOSS,
Director of the Station.